

Thomas Mair:

Growth dependent alterations of the energy metabolism in neuronal cell cultures

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Abstract:

Glycolysis is an essential pathway of the energy metabolism in astrocytes which supplies energy-rich intermediates for neurons, via the so called lactate shuttle, in order to maintain the energy fuel of neurons. We investigated the energy state of cell cultures from the hippocampus of new born rats as a function of their growth state by spatiotemporal recordings of NAD(P)H-fluorescence. We stimulated the cells by local application of different chemicals and found, that cyanid inhibition of respiration leads to a pronounced increase of NAD(P)H fluorescence. This response was growth dependent and increased until about 15 days. Thereafter it decreased again. With the neurotransmitter NMDA as stimulus, we found also an increase of NAD(P)H-fluorescence, but now with 2 optima. A first one between day 6 and 12 and a second one between days 17 to 24. At the optimum of cyanid stimulation there was no response of the cellular NAD(P)H to NMDA. We interpret these data such, that there is a switch between glycolytic and respiratory energy metabolism during growth of these cells. At certain time points we found also spatiotemporal fluctuations of intracellular protons.